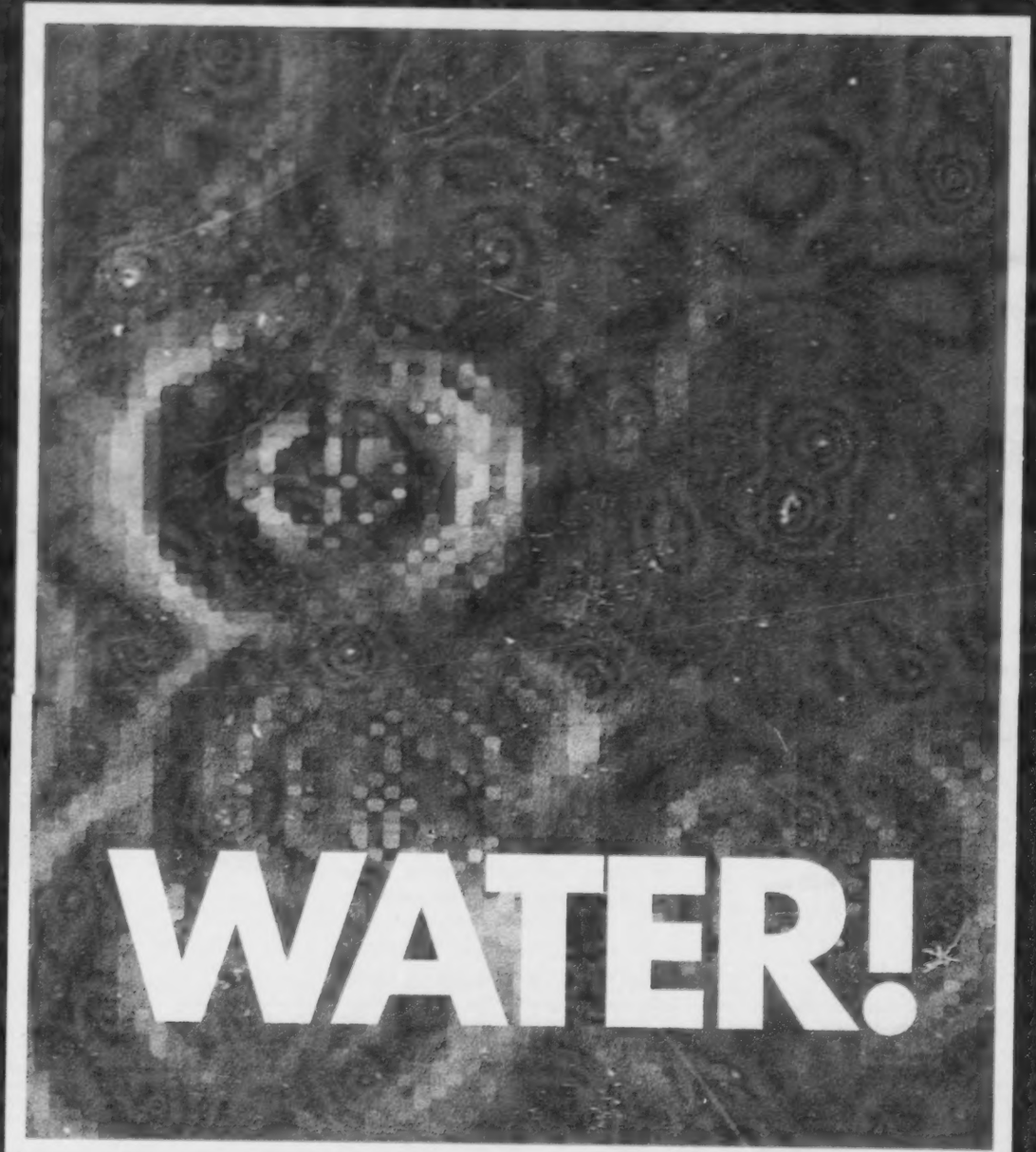
THE MAGAZINE OF THE WORLD HEALTH ORGANIZATION

WORLD HEALTH

JULY-AUGUST 1992



WATER!

WORLD HEALTH
THE MAGAZINE OF THE WORLD HEALTH ORGANIZATION

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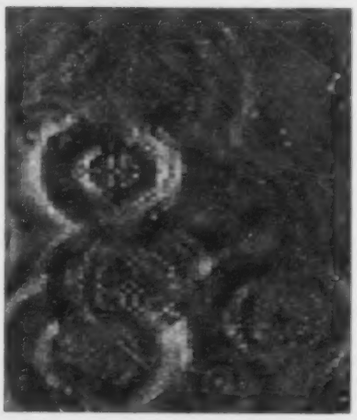

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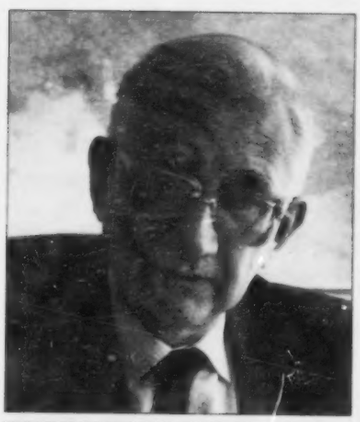
Editorial

Water for all: a human right

Nikolai P. Napalkov



Dr Nikolai P. Napalkov, Assistant Director-General, WHO

Let us make the 1990s the years when all countries and the international community, working together, will aim to provide all the peoples of the world with enough water for their needs.

Despite the achievements of the 1980s – an additional 1600 million people were served with safe water supplies – an estimated 1200 million people in developing countries still do not have proper access to safe water. They are at constant risk of contracting water- and sanitation-related diseases. The upsurge of cholera since 1990 has underlined the need for clean water to protect health, particularly in the expanding shanties and slums in and around the cities of developing countries.

Governments and the international community are clearly willing to take up the challenge of Water for All at various international forums. The UN General Assembly in December 1990 recognized that both national efforts and international cooperation must now be intensified.

An adequate quantity of water, by itself, is not enough to safeguard health. Unsafe water supplies lead directly to diseases that affect hundreds of millions of people, mainly living in the tropics. This issue of *World Health* describes some of the problems and what is being done about them.

An accessible and safe water supply, improved personal and domestic hygiene, and stronger community participation are the main ways to avoid water-borne diseases. But to be really effective they must be accompanied by other measures such as pollution control and proper drainage of surface waters. Since environmental protection of fresh water sources is the basic step to ensure a sustainable clean water supply, this must always be an integral component of both environment and health programmes.

The people now unserved do not represent the full challenge. Because of the high rates of population increase in developing countries, an additional 890 million people – not yet born – will need to have access to safe water by the year 2000, raising the figure of people in need to almost 2500 million, of whom almost 40% will be urban poor.

Water is a basic human need for health – indeed, for survival – and therefore it is not an exaggeration to call it one of the basic human rights. Without safe water and sanitation, there is no real development. A community ravaged by diarrhoeal diseases, dracunculiasis or schistosomiasis cannot look beyond its immediate problems towards social and economic welfare. Safe water is the doorway to health and health is the prerequisite for progress, social equity and human dignity.

Let us make the 1990s the years when all countries and the international community, working together, will aim to provide all the peoples of the world with enough water for their needs, water which they can trust and use with confidence. ■

News from the waterfront

Richard Helmer

Not a week goes by without news from the waterfront. We read in the press and see television pictures of catastrophic floods in Bangladesh, devastating droughts in the Sahel, barren lands in Zimbabwe and avalanches in Anatolia. We have also witnessed the emergence of water pollution damage beyond hope of repair in some eastern European cities and the unstoppable encroachment of cholera over the South American continent. Not a week goes by without news from the waterfront.

Water is essential to life on earth. Plant and animal life are vitally dependent on water, which is an essential ingredient and a lubricant of nature. Human existence is affected if there is too little or too much water and, if it becomes polluted, it becomes a health threat and a hindrance to economic prosperity. There is hardly any current issue that more conclusively demonstrates the integrated nature of environment and development than that of fresh water. The challenge of securing for all people the basic human need of a reliable supply of fresh water, adequate in quantity and in quality, is perhaps the most fundamental development issue.

International responsibility

The role of water for health was fully recognized by the recent WHO Commission on Health and Environment, which highlighted the heavy burden of water-related diseases on humankind. This Commission was convened to assess the health consequences of environmental change and socio-economic development, and its report featured as WHO's main contribution to the UN Conference on Environment and Development, held in June of this year in Rio de Janeiro.

Sustainable development requires us to be aware of ecological rules and to assume full responsibility for our common future.

The Commission emphasized the crucial importance of having healthy people to ensure environmentally sound and sustainable development. Earlier this year, the International Conference on Water and the Environment, held in Dublin in January, brought together 500 government-designated water experts from 100 countries and 80 international organizations. These experts warned that

This stamp from Zaire stresses the importance of safe water for development.

Most human activities are dependent on water.

human health and welfare, food security, industrial development and the ecosystems on which they depend are all at risk unless our rivers and lakes are treated more responsibly and effectively, with land and water resources management going hand in hand. The problems are here with us today and affect humanity now.

High standards of living are associated with high water consumption, and it is not uncommon for water to be used at rates of 400 litres per person per day. The relative abundance and reliability of water supply in the industrialized countries is, to a large extent, the factor that has allowed economic growth to take place. But is it really necessary to use 5000 litres of fresh water to produce an eight-ounce boneless steak in California? During the last two decades the industrialized world has started to realize the importance of preserving water resources if development is to be sustainable in the long run.

Day-to-day concerns

Today, well into the 1990s, over a quarter of the world's population still cannot meet the basic human needs of enough food to eat, clean water to drink, and sanitation to maintain personal hygiene. In the developing world as a whole, there is an immediate need for improved standards of living and, in particular, for the alleviation of poverty and elimination of water-borne diseases. These day-to-day concerns easily override the more distant concerns about climate change, biodiversity conservation, and other long-term global environmental problems. This dual perspective on environment and economic growth in developed and developing countries played a determining role and prepared the ground for a consensus at the Rio conference.

Economic growth and prosperity in the developing world are to an ever greater extent triggered by the gross domestic product generated in the cities. Tragically, this is accompanied by informal settlements and human misery in peri-urban slum areas. For example, in Port-au-Prince, Haiti, the infant mortality rate in urban slums is almost three times that in rural areas; the incidence of tuberculosis in Soweto, South Africa, is more than 100 times that among the high-income areas of the same city. Contaminated drinking-water and a lack of sanitation proliferate the spread of faecal pathogens, as the current cholera epidemics in Africa and Latin America vividly demonstrate.

Industries, whose demand on water resources accounts globally for only about 10%, are responsible for most of the hazardous substances that pollute surface and underground water. Proper pollution safeguards, effluent treatment, and recycling of waste water will have to be rigorously applied if sustainable industrial development is to be achieved, and the "polluter pays" principle will have to be enforced.

Rice paddy in Indonesia. Water used for agriculture can carry diseases.

To feed the hungry

By the year 2025 the world will probably have over 8000 million people to feed, 60% more than today. Achieving food security is a first priority in most developing countries, and rain-fed crop production could only satisfy a fraction of this demand. Man-made irrigation systems have helped to boost crop production, but more than half the water is generally wasted in the irrigation process. Much environmental damage has been due to waterlogged soils and widespread soil salinity leading to depressed crop yields.

A price is also paid in terms of human ill-health with the reintroduction of disease vectors living in the new irrigation canals. Schistosomiasis is found today in 76 countries, where around 200 million persons are infected and another 400 million at risk of infection. Rural drinking-water supplies, however, have successfully expanded in coverage during the International Drinking Water Supply and Sanitation Decade, and have

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reduced the risk of water-borne diarrhoeal diseases.

The water experts assembled in Dublin unanimously recognized that concerted action across all professional and political boundaries is needed to reverse the present trends of overconsumption, pollution and rising threats from droughts and floods. This requires fundamental new approaches to the assessment, development and management of freshwater resources, ranging from large international river basin programmes to the smallest village water committees. One such example is the UNEP-initiated Zambesi Action Plan covering an entire African river which provides water to more than 20 million people in eight countries.

In the end, the key to the water problem is people. People determine whether we are able to avoid a "water crisis", resolve political conflicts over equitable access to water, and wisely use and protect this precious natural resource. Personal commitment is a prerequisite, from the village farmer to the political decision-maker. Development, to be sustainable on a long-term basis, requires us to be aware of ecological rules and to assume full responsibility for our common future. ■

Dr Richard Helmer is a Scientist with the Prevention of Environmental Pollution Unit in WHO's Division of Environmental Health, 1211 Geneva 27, Switzerland.

From the water tower to the rudimentary tap ...

... technology should serve human health.

The Dublin Statement on water and sustainable development

Scarcity and misuse of freshwater pose a serious and growing threat to sustainable development and protection of the environment. Human health and welfare, food security, industrial development and the ecosystems on which they depend, are all at risk, unless water and land resources are managed more effectively in the present decade and beyond than they have been in the past.

Five hundred participants, including government-designated experts from a hundred countries and representatives of eighty international, intergovernmental and nongovernmental organizations, attended the International Conference on Water and the Environment (ICWE) in Dublin, Ireland, on 26–31 January 1992. The experts saw the emerging global water resources picture as critical. At its closing session, the Conference adopted this Dublin Statement and the Conference Report. The problems highlighted are not speculative in nature; nor are they likely to affect our planet only in the distant future. They are here and they affect humanity now. The future survival of many millions of people demands immediate and effective action.

The Conference participants called for fundamental new approaches to the assessment, development and management of freshwater resources, which can only be brought about through political commitment and involvement from the highest levels of government to the smallest communities. Commitment will need to be backed by substantial and immediate investments, public awareness campaigns, legislative and institutional changes, technology development, and capacity building programmes. Underlying all these must be a greater recognition of the interdependence of all peoples, and of their place in the natural world.

In commending this Dublin Statement to the world leaders assembled at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in June 1992, the Conference participants urged all governments to study carefully the specific activities and means of implementation recommended in the Conference Report, and to translate those recommendations into urgent action programmes for WATER AND SUSTAINABLE DEVELOPMENT.

The legacy of the Water Decade

Dennis B. Warner & Louis Laugeri

We now understand much better the links that exist between water and health. However, our strategies for the 1990s should take account of many areas of research.

Drinking-water and sanitation improvements could halve total infant and child mortality.

From an environmental health standpoint, the end of the International Drinking Water Supply and Sanitation Decade (1981–1990) finds 1000 million people without a safe water supply and almost 1800 million without adequate sanitation. And these shocking figures mask a large number of equally shocking health conditions.

There are many ways in which unsatisfactory water and sanitation conditions can result in poor health. Classical water-borne diseases include cholera and other diarrhoeal diseases, while water-related parasitic diseases include schistosomiasis, dracunculiasis (guinea-worm disease), onchocerciasis (river blindness) and malaria. Now, a further category must be added – illnesses resulting from the nitrates, heavy metals and pesticides that have become both the life-blood of our industrializing societies and, unfortunately too often, the pollutants of our drinking-water.

Improvements in water and sanitation can save lives

Drinking-water and sanitation improvements could reduce the overall incidence of infant and child diarrhoea by one quarter and cut total infant and child mortality by more than one-half. Country programmes are increasingly taking measures to improve water supply and sanitation within their primary health care programmes. Guinea-worm disease can be effectively prevented by providing safe drinking-water and its global eradication is clearly possible within the next few years. As for schistosomiasis, some 60% reduction could be achieved by improving water supplies. Building latrines, giving health education and introducing selected drug therapy could reduce the prevalence even more.

Strategies for the 1990s

Water and sanitation programmes are very complex. Their primary purpose is to improve the quality of water, to reduce the transmission of diseases, and to lessen the burden of water

hauling (usually a woman's burden). But they should also include training programmes ranging through all levels of education, as well as health education.

Governments and external agencies have important roles to play – the former by drafting well-defined strategies and objectives, as well as integrating all the organizational levels; the latter, by promoting sustainable projects that involve the communities.

We now understand much better the links that exist between water and health. However, our strategies for the 1990s should take account of many areas of research, such as the effects on health of specific water contaminants, how effective school curricula can be in changing the hygiene habits of children, or the effectiveness of programmes which integrate other primary health care activities, such as oral rehydration or hygiene education.

Politicians, planners, health administrators and other influential people should be kept constantly aware of the benefits for health of improving water and sanitation. We must orient our concerns in programme development towards projects designed to focus on people and their long-term health and welfare. We also urgently need a new spirit of cooperation among the governments of developing countries and the external support agencies — a new spirit that is based on the frank recognition of existing problems and a willingness to subordinate particular national interests to the common good. ■

Dr Dennis B. Warner is unit manager and Mr Louis Laugeri is technical officer in the Community Water Supply and Sanitation unit of WHO's Division of Environmental Health, 1211 Geneva 27, Switzerland.

A Zimbabwean community builds its latrines.

Water and sanitation programmes should include health education.

Schistosomiasis

Ibrahim is 18, but he is constantly tired and occasionally sees fresh blood in his urine. When he finally saw a doctor, the diagnosis was not difficult. A urine test showed the presence of blood. When the doctor examined the specimen under the microscope he found the typical eggs of *Schistosoma haematobium*. Ibrahim lived near a stream and often swam there. That, said the doctor, is where he had been infected.

Schistosomiasis, also known as bilharziasis, is caused by a small fluke or worm which lives in the walls of the gut or urinary bladder of humans, depending on the species. The female fluke produces huge numbers of eggs each day, and these are excreted in stools and urine. When they reach water, they hatch into parasites and seek a new host – a type of freshwater snail. In the snail, the eggs develop into microscopic organisms called cercariae, which are released in large numbers into the water. They penetrate the skin of people like Ibrahim who come in contact with the water. When they reach the gut or the bladder they develop into flukes – and the whole cycle can start again. About 200 million have the infection, and some 200 000 persons die each year from this chronic debilitating disease.

A new drug called praziquantel, developed in collaboration between the pharmaceutical industry and WHO, is effective in a single dose. But as always, prevention is better than cure. The life-cycle of the fluke must be broken. People must use latrines, so that the water-snails will not become infected, and should avoid skin contact with infected water. WHO is working with scientists around the world to find new or improved drugs, to develop a vaccine, and to find easier means of diagnosis.

Only four more years

Ernesto Ruiz-Tiben

The ideal way of preventing dracunculiasis: provide safe drinking-water.

1995 is the target date set by the World Health Assembly in May 1991 for eradicating dracunculiasis (guinea-worm disease). The same target date was set by African ministers of health during their annual meeting in Brazzaville in September 1988. Fewer than four years remain now to attain the goal of zero cases by the end of 1995.

Humans become infected by drinking water containing small crustaceans (cyclops, or "water fleas") that have ingested larvae of the parasite *Dracunculus medinensis*. Since the disease is transmitted only by drinking contaminated water, the ideal intervention is to provide safe drinking-water, which also prevents many other diseases. In 1988, a water supply project funded by Japan's International Cooperation Agency began in the Nanumba District of Ghana, and supplied a total of 159 borehole wells to villages with endemic disease. The incidence of guinea-worm disease in Nanumba District fell from 14 000 cases in 1989 to 3 241 cases in 1990, a 77% reduction. During 1991, Ghanaian news papers reported that the price of yams in the area became depressed because of a "yam glut" resulting from stepped-up production attributed to the relative absence of dracunculiasis. Similarly, cases of guinea-worm disease in Kwara State, Nigeria, where a UNICEF-assisted rural water supply project had been active since 1986, dropped from 50 356 in 1988 to 12 081 in 1990, a 76% reduction.

Dr Donald Hopkins, Senior Consultant with the Global 2000 Project of the Carter Center in Atlanta, Georgia, USA, is the "sparkplug" of the global initiative to eradicate dracunculiasis. He quotes from Lewis Carroll's *Alice in Wonderland*: "If you don't know where you are going, any road will get you there", to dramatize the importance of nationwide village-by-village searches in each endemic country to identify those villages with endemic disease and estimate how many cases are occurring. With support from UNICEF, WHO, UNDP and Global 2000, all endemic African countries except Chad, Ethiopia, Kenya and Sudan have now passed the first two critical milestones on the road to eradication – completing a nationwide survey and developing a plan of action for the national eradication effort.

The third milestone is to list villages with endemic dracunculiasis and give high priority to providing them with safe drinking-water. Water supply sector organizations need to be represented in an intersectoral committee or task force at national and subnational levels to plan, coordinate and carry out the targeting of endemic villages. In Africa so far, Benin, Burkina Faso, Cameroon, Ghana, Nigeria, Togo and Uganda have created such intersectoral groups. But worldwide only India and Nigeria have announced an explicit policy of targeting water to villages with high endemicity of dracunculiasis; other countries with endemic disease need to do the same. Only Ghana and Nigeria have successfully used their data on the disease to solicit support for additional water projects.

A modest investment needed

What is particularly exciting and encouraging from the results of the national case searches thus far is that the intensely focal nature of this disease provides an opportunity to speed up the elimination of transmission by concentrating on those areas. For example, in Nigeria where about 90 000 villages need improved supplies of drinking-water, there were only 4908 (about 4%) in 1991 where cases of dracunculiasis occurred; indeed, 60% of all cases in Nigeria occur in only 500 villages, whose population have the very lowest health status. Considering that from 5000 to 7000 new water points are expected to

With a small modification, the housewife's flour sieve ...

... can filter the water and break the transmission cycle

be installed in Nigeria each year, if only 10% of these are allocated to those 500 villages a major permanent reduction in the disease would occur. A modest investment in a safe water supply for some of the most critical areas would greatly accelerate the eradication of dracunculiasis.

In March 1992, the Fourth African Regional Conference for Dracunculiasis Eradication met in Enugu, Nigeria, to review the progress being made by national and international efforts. The theme of the conference was "Target 1995: Only Four More Years". The role of the water supply and health education sectors was highlighted by the attendance of representatives from these sectors from each of the endemic countries. Workshops on health education, water supply and surveillance enabled them to draw up recommendations on health education and water supply policies which will speed up the eradication process.

Water is an essential component of life. Its availability and quality are of critical importance to our natural and human environments. For dracunculiasis eradication, the "bottom line" as regards quality is to provide drinking-water free from "water fleas". The water supply sector *now* has a unique opportunity to play a pivotal role in the eradication of dracunculiasis. ■

Dr Ernesto Ruiz-Tiben is a Special Consultant to the Global 2000 Project of the Carter Center in the USA. He is also Guest Researcher at the Collaborating Center in Dracunculiasis, Centers for Disease Control, 1600 Clifton Road, N.E. Atlanta, GA 30333, USA.

Onchocerciasis

The site selected to develop a Christian community in eastern Mali seemed to have everything: fertile soil, a river full of fish, and plenty of space. In 1958, a group of 50 people founded the village of St Pierre. Seven years later almost everyone in the village was sick. Most of them had large nodules under their skin, and many were going blind. The community had lost all its early vitality. Visiting health teams soon identified the cause: onchocerciasis. The river that had seemed a blessing was the source of the disaster. Its fast-running waters were an ideal breeding-ground for the *Simulium* blackfly which transmits the parasite responsible for "river blindness". Within the human host, the parasite develops into a worm, *Onchocerca volvulus*, which causes both the nodules and blindness. By 1968, the village of St Pierre was deserted.

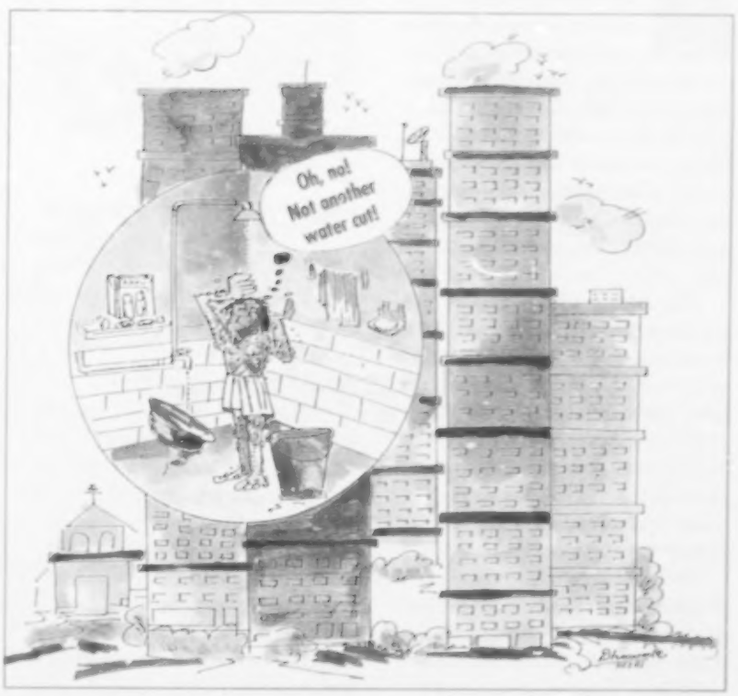
At that time, no really effective drug was available, and the Onchocerciasis Control Programme carried out by WHO, with support from the World Bank and others, only started in 1974. The programme has been so successful in controlling the blackfly, mainly through dropping insecticides into rivers where the fly breeds, that 20 million people are now protected in West Africa, and 6 million hectacres of rich land – previously uninhabitable because of onchocerciasis – are safe for farming.

A very effective drug, ivermectin, has been developed against the disease and the manufacturer, Merck, Sharp & Dohme, is providing it free to all endemic countries. Some 17 million people still suffer from this disease worldwide, so there can be no let-up in the battle to defeat it.

When city growth exceeds supply

Purushottam Khanna & Bindu Koshy

A great surge in the population of India's big cities poses huge problems for safeguarding water supplies.



In India, about 190 million people in 1989 lived in urban areas; they constituted 24% of the total population, compared to a meagre 11% at the beginning of the twentieth century. In the 40 years after independence, while the total population of India has doubled, the urban population has tripled; it is estimated to reach a staggering 315 million at the turn of the century.

This amazing surge in the population of the cities has inevitably resulted in inadequate shelter and basic amenities, lack of access to clean water in adequate quantities, poor sanitation, environmental pollution and resource depletion – all of which pose insurmountable health and environmental risks. Around 30% of the population in urban agglomerations today live in squatter areas – and the largest single cause of infant mortality in India is diarrhoeal and other intestinal disorders.

Several government programmes aimed at dispersing the urban population have met with only marginal success due to the multiplicity of planning and implementation agencies, the absence of an integrated approach to the problem, and the lack of financial resources.

The targets for the International Drinking Water Supply and Sanitation Decade (1981–90) in India were fixed at 100% coverage for urban and rural water supply, 80% for urban sanitation and 25% for rural sanitation. The erstwhile Ministry of Works and Housing proposed an outlay of Rs. 190 883 million (approximately US$ 11.5 million) to achieve Decade objectives, but resource constraints permitted an outlay of only Rs. 65 220 million (almost US$ 4 million, based on exchange rates in 1989). As a result, the targets for urban water supply and sanitation were cut back to 90% and 50% respectively. Cost-effective designs were able to alleviate the problem but only to a certain extent.

Our studies on cost reduction through optimization of water supply and wastewater systems suggested that any integrated solution to the problem of water supply in the big cities should include:

- Integration of water and wastewater management, coupled with health education for cost-effectiveness and promotion of preventive measures for health;
- Prospecting for water resources through state-of-the-art techniques of remote sensing and geophysical surveys;
- Protection of water sources against pollution;
- Decentralization of water supply, matching the required quality and quantity with the supply through waste recycle and reuse;
- Maintenance of the water distribution system, which can prevent up to 50% of the purified water from being lost;
- Application of mathematical programming techniques with exact fluid flow relationships in the design of water and wastewater systems, so as to ensure functionality and to conserve material and financial resources. ■

Dr Purushottam Khanna is Director of the National Environmental Engineering Research Institute, Nagpur 400 020, India. Mrs Bindu Koshy is a Junior Research Fellow in the same Institute.

Recycling human waste

Ivanildo Hespanhol

The use of low-quality waters will become commonplace during the next century as freshwater resources grow scarcer. The health implications must not be ignored.

Many wastes generated by modern societies represent a valuable resource which can be reclaimed, recycled or reused for man's benefit. This ensures that solid and liquid wastes are not dumped on soil or water courses, thus avoiding environmental degradation and safeguarding sources of fresh water for drinking and other beneficial uses.

The use of wastewater for irrigating crops can actually be traced back to ancient Athens. For thousands of years in the Far East, human wastes have been used to fertilize ponds to produce fish and aquatic weeds. Today, many countries in both the developing and the industrialized world utilize domestic wastewater to irrigate farm land.

Well-managed wastewater irrigation systems contribute to raise food production and thus improve health, the quality of life and social conditions. There are several other advantages. Apart from avoiding pollution and protecting the drinking-water supply, such systems preserve groundwater resources in areas where their overuse in agriculture is causing salt intrusion or other types of damage to the aquifers. The build-up of humus helps to prevent land erosion. Nutrients available in treated wastewater, especially nitrogen and phosphorus, can, in many cases, eliminate the need to use synthetic fertilizers. And studies carried out in several countries have shown that crop yields can increase if wastewater irrigation is provided under proper management.

Health guidelines for the use of wastewater in agriculture and aquaculture, WHO Technical Report Series No. 778, is available in English, French, Spanish and Arabic, and can be obtained from Distribution and Sales, WHO, 1211 Geneva 27, Switzerland.

Health guidelines

WHO has been providing countries with health, environmental and technical guidance for establishing and improving wastewater use systems, especially in the Eastern Mediterranean Region. In the arid and semi-arid regions of the world, lack of water has become a limiting factor for agricultural and industrial develop-

In Cyprus, the cotton grows using recycled wastewater.

The Al-Samra stabilization pond in Jordan.

ment. Governments are continuously searching for additional ways of supplementing the scarce water resources available. Health guidelines (see box on p. 12), published in 1989, have been used as a basis for developing national standards and codes of practice for wastewater reuse.

Four groups can be exposed to the risk of communicable diseases through agricultural reuse systems: consumers of crops, field workers and their families, crop handlers, and people living nearby. All have to be safeguarded by applying four integrated protective measures:

- wastewater treatment, to ensure that the treated wastewater applied to the crops is free from pathogenic organisms;
- wastewater application techniques, to avoid as much as possible letting wastewater enter into contact with the edible parts of crops;
- crop selection, to limit the use of wastewater for irrigating crops which are not consumed directly (industrial and fodder crops), or which grow well above the ground (tomatoes and chili), or crops not eaten raw (potatoes);
- human exposure control, by advising farm workers and their families, crop handlers and consumers through programmes of health education, immunizing them against typhoid and hepatitis A, and providing regular chemotherapy and adequate medical facilities to treat diarrhoeal diseases.

One of the greatest challenges of the next century will be to ensure the appropriate management of water resources. The use of low quality waters, such as wastewater, drainage waters or brackish waters, will certainly become commonplace as freshwater sources become less and less available around the world. Since the use of these waters may be associated with detrimental effects to soil, crops and human health, appropriate protection measures should be undertaken accordingly.

WHO will collaborate with any country requesting technical advice on wastewater reuse systems in such a way that both the environment and the public are adequately protected and preserved. ■

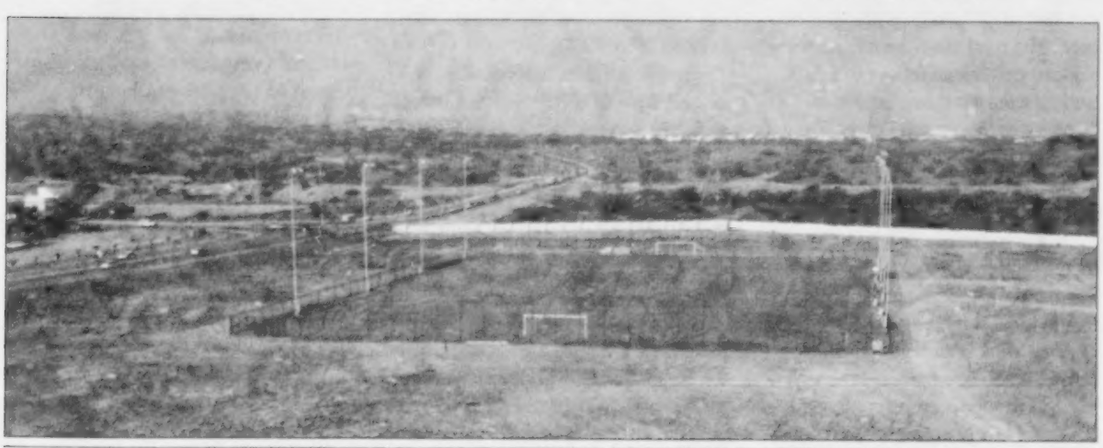
AL-SAMRA WASTEWATER TREATMENT PLANT

In hot countries, wastewater can be treated at low cost, without any complex technology, simply by using nature's power to produce oxygen. The wastewater which is retained for an adequate period in well-designed ponds, becomes stabilized under the action of solar energy, bacteria and algae.

Al-Samra, near Amman in Jordan, is probably the largest stabilization pond complex in developing countries. It covers an area of approximately 180 hectares and treats the domestic wastewater from Amman and Zarka, with a total of about 1.5 million inhabitants. About 1% of the treated pond effluent is used for irrigation around the pond. About 1.5 million trees, particularly olive trees, grow in the area and are irrigated exclusively with the treated wastewater from the pond.

The remaining effluent from the pond is diluted in the King Thalal Reservoir and is utilized for irrigation of various crops along the Jordan Valley.

Dr Ivanildo Hespanhol is a Scientist with the Prevention of Environmental Pollution unit of WHO's Division of Environmental Health, 1211 Geneva 27, Switzerland.



A soccer field in Muscat (Oman): wastewater can make the desert green.

A new target date

Mark R. Mujwahuzi

Systematic development and management of water supplies at country level in Tanzania started in the 1930s, but the problem of water supplies for rural communities was not confronted until the 1950s. Before any rural community could have a water supply system developed for its use, a relevant local authority had to make a prior deposit of 25% of the total capital cost. Operation and maintenance costs were met by the local authority using funds collected from water consumers. This system – which favoured the richer local authorities – prevailed until Tanzania became independent in 1961.

After independence the government of Tanzania decided to redress the imbalance in water supply development between different areas in the country. In 1965, it started financing the construction of all new water supply systems in the countryside, and from 1970 it has met the costs of operating and maintaining all rural water supply schemes.

In 1971, the government embarked on a 20-year programme aimed at providing clean and potable drinking-water within 400 metres of every rural household by 1991. This entailed huge financial as well as human resources, so the government was forced to look for external assistance. The rural water supply sector began receiving an inflow of funds from at least ten donor countries. The Ministry of Water and Power advised the donors to concentrate their support in selected regions, and this concentration approach is still being followed.

In many regions receiving water sector support from external donors, the main implementing agent has been the regional water engineer, supported by his staff at both regional and district level. In a few cases this work has been undertaken by contracted consulting engineering firms from the donor countries.

Building the water supply for the village

Technological mix

Early studies indicated the need to develop an appropriate technological mix if the 20-year goals were to be obtained. This mix consisted of handpump technology, surface pumped systems, borehole pumped systems and gravity supply technology, depending on the water source available as well as the nature of the terrain. Although handpump technology was expected to be used in providing water to 50% of the people to be served, gravity supply technology where practical has been preferred over other technologies.

One important component is the involvement of beneficiaries. Communities have to participate fully in the planning, development, operation and maintenance of schemes. They also undertake unskilled work such as digging trenches, helping technicians to lay pipes and offering support to the technical teams.

Once the construction is completed, the facilities are handed over to the beneficiaries, who are encouraged to maintain "water funds" to buy spare parts and to pay attendants who look after the facilities. This involvement of the beneficiaries has contributed tremendously to improving the sustainability of the water supply schemes.

Achievement

Despite the government's efforts, the 1991 target was not achieved. Today it is estimated that an average of 45% of the rural population and about 65% of the urban population in Tanzania are being served with adequate potable water. The government has now set a new target date – the year 2002.

Yet much has been achieved. The number of people with easy access to sources of adequate potable water has increased from 7.4 million in 1981 to 8.7 million in 1990. Thanks to the beneficiaries who are now more involved in new water supply schemes, people's perceptions of the schemes have changed and they view them as their property. Consequently they are much more willing to protect, operate and maintain their own water supplies. ■

Mr Mark R. Mujwahuzi is with the Danida Water Project in Maji Ubongo, P.O.Box 9171, Dar es Salaam, Tanzania.

Not a drop to drink

Bruce M. W. Fisher

The diaphragm water pump of Kiribati

Kiribati (pronounced Kiribus) consists of 33 islands, mostly atolls, scattered over about five million square kilometres of ocean and extending about 4,000 km along the equator. The atolls are typically low-lying strips of sand and reef, usually less than 500 metres wide, curving to enclose a lagoon. No surface water sources are available.

Only the western atoll of Tarawa, with its population of 25 000, enjoys a piped water supply and sewerage system. Inhabitants of other atolls resort to individual water sources and on-site sanitation.

Groundwater in the atolls consists of a lens of freshwater formed just below the surface and above the sea-water which permeates the lower underground strata. Water in the freshwater lens moves gradually from the thickest part near the centre of the island to outlet springs and other openings near the shoreline, taking in any pollution it finds on the surface or from latrine pits. As Kiribati's sanitation programme had promoted four flush pit latrines near the villagers' houses, drinking-water in wells located near such houses is often, if not always, polluted.

Small-diaphragm pumps

Partly in response to this, a WHO-supported rural water supply programme adopted a novel approach to atoll water supplies by introducing small-diaphragm pumps previously used only for priming larger centrifugal pumps. The diaphragm pump makes it possible for households living by the sea to tap the wells at the centre of the island, far away from the latrines. A suction main connects the wells to the pump sites located by the houses.

Compared with most pumps, diaphragm pumps have many advantages. They can be installed adjacent to the houses and yet draw water from sources over 500 metres away. No priming is necessary, and they are easy to install. While the cost of a pumping unit has increased considerably in recent years, it remains a little over US$ 100. Maintenance can be carried out by village workers – provided spare parts are available. Initially the pumps were a source of much joy among local children, who played with the pump handles and damaged them. These were replaced by removable wooden handles.

The relative thickness of the freshwater lens at the centre of the island ensures a more abundant supply of water. Overpumping the thinner part of the lens, on the other hand, can draw sea-water into the well, especially during dry periods.

While it is expected that solar pumping will be more widely used in the longer term, solar units are costlier to install and maintain, and they present a greater risk of overpumping the underground water lens. Until such constraints are overcome, diaphragm pumps will remain the most viable and effective means of meeting water supply requirements in the atoll communities of Kiribati. ■

Small diaphragm pumps are bringing safe water to villagers in tiny atolls of the Pacific Ocean, where there is "Water, water everywhere, nor any drop to drink".
(S.T. Coleridge: *The Rime of the Ancient Mariner*)

Mr Bruce M. W. Fisher is a Sanitary Engineer, WHO Western Pacific Regional Centre for the Promotion of Environmental Planning and Applied Studies (PEPAS), P.O. Box 12550, 50782 Kuala Lumpur, Malaysia.

Water is part of a large constantly moving cycle. Simply explained, it evaporates from the surface of the earth, and turns into clouds that produce rain and snow, which fall on the earth's surface. Then through rivers and underground water tables it passes to the oceans and lakes, and thus the cycle continues.

Climatic changes caused by human activity – like cutting down forests – have reduced the water supply in many parts of the world. As temperature and rain and snow precipitation patterns change, many rivers carry less water. At times they carry too much water, resulting in floods. Trees and other vegetation help to retain water in the soil and prevent landslides. Chemical substances from industry sometimes pass into the air. One of the results is acid rain, which kills fish and vegetation in many lakes and rivers. Sometimes dangerous products from industry, agriculture and other human activities enter the rivers, lakes, oceans and underground water, and can contaminate our drinking-water.

At the same time, the demand for water from villages and towns, and from industry and agriculture, is steadily increasing. Water can therefore no longer be considered an unlimited resource, which costs nothing and which can be wasted. In the next century water supplies will certainly be considered a very valued service, and each one of us will have to pay what it costs to have clean water.

Cholera in Peru

Fred M. Reiff

Peru is making determined efforts to disinfect community water systems and thus control this ancient pestilence.

Since 7 March 1992 Peru has suffered more than 400 000 cases of cholera and over 3100 deaths in the epidemic which broke out in this country in late January 1991. Cholera is usually spread from one location to another by people, and can also be propagated by contaminated water. Travel is relatively inexpensive in Peru and the people use the well-developed national transport system extensively. This mobility to a large extent helped to ensure cholera's rapid introduction into all parts of the country, and as long as there is even one focus of infection it can spread in this way.

The appearance of cholera, however, does not necessarily result in epidemic propagation, which occurs only where environmental health conditions and hygienic practices are deficient. This was confirmed in Latin America, where the overwhelming majority of cholera cases have been in economically disadvantaged areas with no basic infrastructure of public services (water supply, sanitation and solid waste disposal).

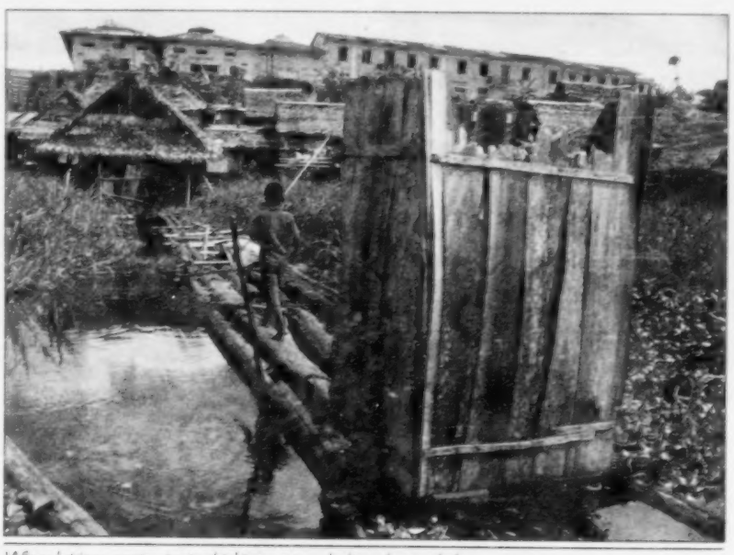
Prompt treatment with rehydration therapy and antibiotics can reduce the severity of the disease and save lives, but this has a limited effect on the spread of cholera. Mass immunization is generally not prescribed as a public health measure because of the short-lived and uncertain immunity it provides. Environmental health measures to protect water and food from contamination (or to decontaminate them) and to promote good personal hygiene practices remain the most effective barriers to the spread of cholera.

Water and food contamination

In the absence of safe water, adequate sanitation and food safety, water and food can be vehicles for the spread of cholera. Indeed, contaminated water is frequently the cause of contaminated food, and it follows that the sanitary disposal of excreta should play a key role in the prevention of this disease. Direct contamination of food with a cholera victim's excreta is a rarity but indirect contamination with polluted water during handling and processing is commonplace. Even when the level of contamination of water is below the infective dose, once it comes in contact with foods which support the growth of *Vibrio cholerae* such as rice, fish, crab, shrimp and so forth, the subsequent proliferation of this organism on the food can result in an infective dose in a matter of hours or even minutes.

Various studies in Peru have demonstrated the poor water quality in many of the areas now affected with cholera. Between 1984 and 1985, 100 water supply systems were examined, including wells, springs and surface water supplies both with and without filtration. Most of them produced contaminated water. Only two of the 40 systems claiming to practise chlorination were satisfactory (with adequate chlorine residuals) and, among the simple gravity systems, none of the 20 claiming to practise disinfection showed chlorine residuals.

In many localities, ice is prepared from water which receives little or no treatment, a situation perpetuated by the myth that freezing destroys the pathogen. This simply is not true. Ice proved to be a common source of food and beverage contamination. Washing-up water used many times by street vendors for glasses, plates



When latrines contaminate drinking-water, cholera danger lurks.

and utensils has also been implicated. Other sources of contamination of food included the use of sewage-polluted water for irrigating food crops, and the eating of raw shellfish such as oysters, mussels and clams, which are filter-feeders and therefore tend to concentrate microorganisms.

Chlorine as disinfectant

Adequate treatment of water used for drinking, for preparing and processing food, for washing dishes and utensils, and for personal hygiene is thus a cornerstone of cholera prevention. Fortunately the most common water disinfectant, chlorine (as hypochlorite) is very effective against *V. cholerae*; it is also extremely cheap, costing an average family between US$ 0.25 and $2.00 each year, depending upon the type of water supply, the local cost of chlorine, the water consumption rate and the method of disinfection. Disinfection by boiling also effectively kills this pathogen but has two disadvantages: it provides no residual protection against recontamination, and it is relatively expensive with an annual cost per family of more than $20.

In order to contend with the epidemic, Peru has increased its efforts to restore, upgrade and expand existing water systems to meet the need of the unserved population. The Ministry of Health and the Ministry of Housing have both started special programmes to disinfect community water systems and there is special emphasis on appropriate technology at the household level. However, the magnitude of the environmental health needs surpasses the capacity of the country to meet them.

Intravenous and oral rehydration.

The Pan American Health Organization (PAHO/WHO) has supplemented national efforts with many forms of assistance and collaboration in the public health sector, an important component of this being related to disinfection and control of water quality. With emergency funds provided by the Interamerican Development Bank, PAHO purchased a total of 100 gas chlorinators and 50 hypochlorinators for installation in community water systems and 10 iodinated resin treatment systems for hospitals, clinics and schools. PAHO and the Pan American Development Foundation also shipped a total of 80 tons of calcium hypochlorite, donated by the private sector, for disinfecting small community water systems in Peru.

Since it is the deterioration in the water, sanitation and health infrastructure that has permitted the introduction and spread of cholera, only the correction of existing deficiencies will eliminate the disease and prevent its reintroduction. The backlog of work to be done is considerable, but there is little question of its necessity. Improvements in basic environmental health conditions will be required if cholera is to be eradicated from Latin America and the Caribbean, or even if there is to be sustained control and prevention of this ancient pestilence. ■

Dirty containers can contaminate safe water.

Mr Fred M. Reiff is a Sanitary Engineer with the Environmental Health Programme in WHO's Region of the Americas, 525 Twenty-third Street, N.W., Washington, DC 20037-9897, USA.

Women and water

Mayling Simpson-Hebert

In the rural Botswana countryside, when the groom's relatives arrive to fetch the bride at the end of the festive day-long wedding celebration, they come to "ask for water". This is the poetic and symbolic expression of a cultural reality. This bride, like most women in rural Botswana and in villages all over the world, will become the water-bearer for her family. Carrying water does not begin at marriage for such women. From the time they are old enough to carry a bucket, children of both sexes are also household water-carriers.

So how involved are the women of Botswana in the planning, operation and maintenance of their village water supplies? To what extent do they occupy higher posts at district and central levels, and what are their chances for advancement in a sector so vital to their lives?

The challenge for developing countries is to transform women from mere water-carriers into planners and managers of water supply systems.

With assistance from the Swedish International Development Authority, the Botswana government provided safe and reliable drinking-water within reasonable access to 80% of rural villages. This is a remarkable achievement in a country where 20 years ago nearly every village used traditional and relatively unsafe sources, such as ponds and dug wells. As Botswana has very little surface water, the programme has focused on an engineering solution: sinking boreholes near villages and piping the water to several standpipes evenly distributed around the village. Women and children come to the standpipes with buckets and carry the water home to be stored in containers.

Limited health benefits

Potential benefits from the new water supply systems are not being fully realized. A recent study showed that water-related hygiene practices in the home are generally not good, that households still fetch water on average seven times a day, and that only those homes very close to a standpipe have increased their

Water has to be carried several times a day ...

... and that takes both hard work and hours of waiting.

consumption of water for hygiene purposes. Long queues at standpipes sometimes cause delays and people occasionally return to more convenient but unsafe sources.

Now Botswana is embarking on a programme to rehabilitate the older water supply systems and to deal with the health issues. As a result, questions of community participation and women's involvement are naturally arising. It is widely recognized that improving the water supply systems and keeping water clean are matters that rest largely in the domain of women.

Obstacles to women's fuller participation in Botswana are the result of traditional beliefs about the roles of men and women. As in many other parts of the world, women are not involved in initial planning because at the community level it is mainly the men who make decisions. Women role-models are needed for the women in villages to be involved in decision-making; but it will be difficult for women to penetrate this sector dominated by men. Women working in the water sector are mostly water supply operators who are paid less than the men who hold professional and managerial posts; very few women go in for technical training so they are confined to clerical jobs. Women themselves are not very confident that it is right for them to take technical jobs, even though they may be performing as well as or better than the men.

Building up confidence

However, these obstacles can be overcome. To step up women's participation in the water sector the world over, they have to be encouraged and recruited at the village level through campaigns giving them information on available technical jobs. Training and employment opportunities have to be offered, with equal opportunities for women to advance through the system as their male counterparts do. To build up women's confidence, certain training courses could be offered to women only, concentrating not only on technical skills but also on assertiveness and overcoming the stereotyped notion that men must do all the planning in the water sector.

Difficulties in involving women in the water sector have been recognized for a long time. In 1983, UNDP launched a research and development project called PROWWESS (Promotion of Women in Water and Environmental Sanitation Services) to find solutions to this problem. The result is a set of training tools for community participation, with the particular goal of involving women in planning and decision-making. These methods have proved effective in achieving women's participation in a wide variety of cultural settings.

With the involvement of the main users of water supply systems, the women, there is a better chance for these systems to be properly maintained and for the health benefits to be realized. Encouraging women's participation in the water supply sector will require a reorientation of priorities, such as putting people's development before the laying of pipes, and a greater commitment at every level to sustain the effort. ■

Dr Mayling Simpson-Hebert is Technical Officer with the Community Water Supply and Sanitation unit in WHO's Division of Environmental Health, 1211 Geneva 27, Switzerland.

The dying Aral Sea

Rudolf Slooff

The "fallout" from the Aral Sea disaster could eventually overshadow that of the Chernobyl nuclear power accident.

Until a few decades ago, the Aral Sea in south-central Asia was the world's fourth largest lake, with a salinity of about one-third that of the oceans. A rich variety of marine life provided a livelihood for tens of thousands of workers in the fishing and food processing industries. Its buffering effect on the harsh local climate made farming conditions easier in the surrounding arid plains during the summer months.

The lake formed the economic and cultural centre of gravity for millions of people living in Uzbekistan and Tajikistan, as well as in parts of Kazakhstan, Kirgizstan, Turkmenistan, northern Afghanistan and north-eastern Iran. As it has no outlet, its water level and salinity were held in near-perfect balance by the freshwater it received from the two main rivers feeding it, the Amu-Darya and Syr-Darya, by percolation from the lake into deeper layers, and by evaporation due to heat and winds.

This precarious balance was cruelly disturbed in the early 1960s, as a result of a policy decision by the central government of the former USSR to widen the area under irrigation in the watershed. Apart from increasing the country's rice-growing potential, the idea was to promote self-sufficiency in cotton production. Both crops require large amounts of irrigation water, and the additional amount was to be extracted from the Amu-Darya and Syr-Darya rivers. Large dams were constructed in these water courses and an extensive network of feeder canals flooded millions of hectares of new land. Whereas roughly 110 cubic kilometres of water entered the lake each year before these diversions started, it received no water at all in 1980 and in 1985, and only 5 km^3 were left to feed the lake in 1989.

The results were disastrous: a fall of about 15 metres in the water level, a recession of the shoreline (in some places up to 120 km), the exposure of large areas of the former lakebed, an increase in salinity and the extinction of virtually all the aquatic fauna and the ecosystems in the two large deltas. This grave situation was no doubt exacerbated by ineffective management and excessive use of irrigation water, poor agricultural practices, and a failure to heed ecological advice.

Stricken lives

The human tragedy is enormous. Although the whole watershed population is affected, the most seriously stricken are those whose daily lives depended on the wealth provided by the lake: the several hundreds of thousands of inhabitants of former lakeshore towns and villages, fishermen, industrial workers and farmers. Initiatives to install fish-ponds along the major irrigation canals, or to haul frozen seafish from abroad to keep the fish-processing industries going, have had marginal impacts. In some villages more than half the houses are deserted. The rusting hulls of fishing boats lie stranded, miles from the present shoreline.

The affected republics have some of the worst health conditions in the

The former waterfront of Aralsk harbour.

whole of the former USSR. The Aral Sea region is characterized by a low life-expectancy, high maternal and infant mortality rates, and high rates of infectious diseases, congenital diseases and cancer. A systematic epidemiological study has not yet been undertaken to define how much ill-health is to be attributed to the ecological changes. But it requires little imagination to see that, with water tables as much as 15 metres down from normal levels, the most outstanding single environmental health risk in the former lakeshore area must be the lack of reliable drinking-water and sanitation. Pesticide residues in the food and water add to the hazards.

The world today is better acquainted with Chernobyl, a catastrophe of equally large dimensions, similarly related to poor resource management and insufficient attention to the environment. Serious as that disaster was, its impact will gradually fade away and, given time, the damage done is reparable. The Aral Sea, on the other hand, continues to die with ever-increasing certainty; the land surrounding it will soon no longer be able to support a decent human existence. The backlash of this disaster could eventually overshadow Chernobyl. Drastic action is needed now. ■

Dr Rudolf Slooff, a Scientist in WHO's Division of Environmental Health, 1211 Geneva 27, Switzerland, is working on a joint WHO/UNEP Action Plan for the Rehabilitation of the Aral Sea.

The fish industry of the Aral Sea uses fish brought from far away.

WHO and Earthwatch are watching!

The United Nations Environment Programme's Earthwatch office and the Global Environment Monitoring System (GEMS) in association with the World Health Organization, UNESCO and the World Meteorological Organization have developed a global water quality monitoring network, called GEMS/Water. Initiated in 1977, the network includes 344 monitoring stations – 240 river stations, 43 lake stations and 61 groundwater stations.

Rivers such as the Rhine, the Nile, and the Ganges and lakes – from Lake Tai in China to the North American Great Lakes – are routinely sampled and analysed. Groundwater, crucial for drinking-water supplies, is sampled in Africa and the Middle East, particularly in areas where no perennial rivers flow. More than 50 water variables are measured, providing information on the suitability of water for human consumption, and for agricultural, commercial and industrial uses. All data are stored and processed at the GEMS/Water global data bank at the National Water Research Institute in Canada, and summaries of the data collected are published every three years. These assessments provide a basis for persuading decision-makers – through factual leaflets and summary documents – to protect and manage water resources as a matter of urgency.

Monitoring is a prerequisite for action. Action is a prerequisite for development. Development should be sustainable. To meet the challenge of sustainable development the GEMS/Water Programme has evolved with changing times and needs. In 1990 it was decided to broaden its scope to include not only monitoring but data interpretation, assessment of critical water quality issues, and management option analysis. The actual global network is also being expanded. Thus more data, assistance and advice can be made available to any government that is keen to protect its water resources.

A checklist of hazards

Barry Lloyd

A user-friendly checklist is helping rural sanitary inspectors and communities to discover potentially dangerous water sources and put them right.

By 1991, after the end of the International Drinking-Water Supply and Sanitation Decade, 83% of the population in the cities of developing countries were served by improved, more accessible, safer water supplies. In rural areas, the figure was only 59%. The basis for claiming safety of rural water supplies is often dubious because a high proportion of people living in the countryside depend on unimproved water sources which are rarely, if ever, tested to check whether they are safe to drink.

Rural water sources include stored rainwater, surface streams and ponds and groundwater from shallow holes in the soil, dug wells (sometimes with a protective lining wall), and shallow hand-pumped and deeper mechanically pumped tubewells. Most of these water sources are poorly protected and continually at risk of contamination by human and animal excreta. In China, for example, of 920 million people living in the countryside I estimate that fewer than 90 million (10%) are served by piped supplies. More than 400 million rural Chinese depend on point-source water supplies and another 400 million still use unimproved sources. This situation is common to most developing countries; the result is that at least 80% of the total population use water which is regularly contaminated by faecal material and are therefore at risk of water-borne disease.

These figures highlight the need for:

— reliable, easy-to-use and cheap methods to identify hazards and quantify the risk to health associated with unsafe water supplies;
— appropriate action to remove the hazards and improve the safety of rural water supplies.

Community-level surveillance

Surveillance has traditionally involved periodic sanitary surveys by environmental health agencies which combine sanitary inspection with analyses of bacterial indicators of microbial contamination and chemical parameters. These activities should be carried out by professional inspectors on-site (at the well) and by analysts in quality control laboratories. Most countries do not have the financial resources to routinely monitor and assess the safety of rural water supplies, let alone maintain them. Consequently the official policy of an increasing number of governments is to leave surveillance and maintenance to community-level organizations.

This does not mean that government agencies should abrogate their responsibilities, but rather that their role should become an educational and enabling one, training local sanitary officers and health promoters to provide basic technical support and education for community initiatives. To this end our Collaborating Centre for the Protection of Drinking Water and Health is supporting WHO in developing and disseminating straightforward methods both for identifying the important sanitary hazards and for protecting and improving rural water supplies.

In order to provide rural sanitary inspectors and communities with an effective means of identifying where the problems occur, and to show how to protect each principal type of water source, I have designed a series of user-friendly, pictorial report forms as a checklist for sanitary inspection at village level.

Adding up the risks

At the site, the sanitarian or health promoter first inspects the facility with the assistance of community representatives, or the owner of the source, and ticks the boxes for all the hazards observed. The number of points of risk can be added up to give a sanitary inspection risk or hazard score in the range 0 (no risk) to 9 (very high risk). The sanitarian also circles each of these points of risk on the diagram, preferably in red. Following a discussion of what needs to be done to

A high-risk well in Peru

improve the facility, the diagram can be separated from the report form and given to the owner or community representative as an *aide-mémoire*. The recipient of the diagram signs the checklist report form which the sanitarian retains for the health centre records.

In the last three years these new sanitary inspection procedures have been evaluated in pilot projects in a number of countries including Indonesia, Nepal, Nicaragua, Peru and Thailand. Our experience in these countries has shown that it is initially difficult to predict the most important hazards causing high-level faecal pollution within a given district. So it is important to gain experience in pilot studies by intensive bacteriological sampling and analysis at the same time as the inspection. With experience the frequency of bacteriological analysis may be reduced, because it is costly, and more reliance can be placed on direct inspection.

At local level in the pilot projects in Thailand and Indonesia, we found that higher hazard scores generally correlate well with increasing orders of magnitude of faecal contamination. We also found that the most common problems are not necessarily those which cause high-level faecal contamination. At district level, *a sanitary hazard* weighting can be computed for each individual hazard, and this helps to suggest the priority for remedial action.

In Thailand particularly, we found that water quality was always improved as a result of remedial action and, in 90% of cases, supplies were improved from grossly contaminated to bacteriologically safe! The likely outcome of the pilot study in that country, which is being managed by the Environmental Health Division of Thailand's Department of Health, is the adoption of the methodology nationally, as it can be applied to all types of rural water supply.

The systematic use of these procedures will be promoted in many other countries of the world, since they provide a practical, easy-to-use tool for identifying the main hazards and determining the priorities for remedial action. The results should be a substantially improved quality of rural water supply and a corresponding reduction in water-borne diseases. ■

Dr Barry Lloyd is Head of the WHO Collaborating Centre for the Protection of Drinking Water & Health, Faculty of Science, University of Surrey, Guildford, GU2 5XH.

Checklist for water inspection in villages

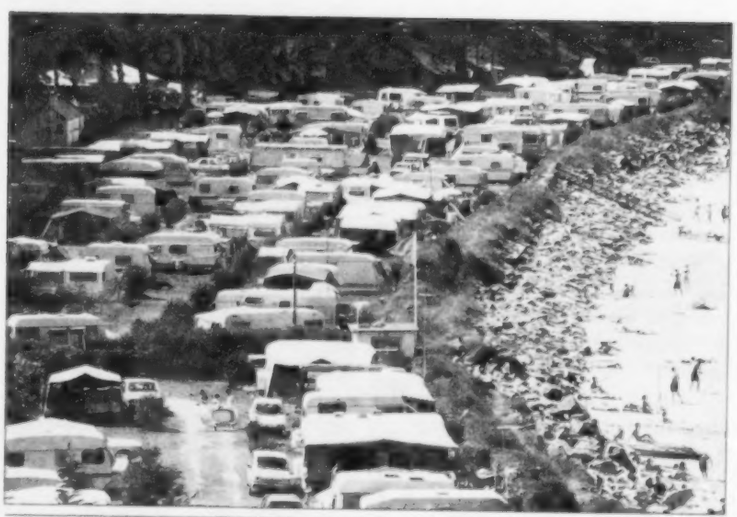
- Identify all actual or potential sources of contamination of the supply.
- Determine the level of risk attributable to each source of water facility.
- Find a pictorial way of explaining to the community what the possible health risks are.
- Give the community clear guidance on how to remedy bad situations and on hygiene education where appropriate.
- Provide reliable basic data to the health centre and to the central planning authorities about the standard of water supply services.

Learning how to analyse water in Thailand

Water sampling and inspection of a tubewell

Seas fit to swim in

Louis Roger Dautriat



A beach in Cape Finistère: the environment is under pressure

Ranging from small communities to large towns, 124 French communes share 795 kilometres of dramatic coastline, some looking north to the English Channel and others south to the Atlantic. This is the coastline of Cape Finistère, the westernmost part of Brittany. The département (county) of Finistère has no fewer than 281 officially recognized bathing beaches.

Such natural advantages have a direct bearing on the region's economy since they encourage the development of leisure activities, swimming and sailing. Tourism is one of the top money-earners for Brittany.

Even apart from the vital need to protect public health, this relationship between the sea and economic development calls for a close watch to be kept over the quality of the water. This is especially true since "public awareness about the cleanliness of bathing areas is now highly developed, in various ways, both locally and nationally," as Maurice Saborin, the Préfet (Departmental Chief) of Finistère, freely admits.

Maurice Saborin and his colleagues on the Departmental Board of Health and Social Action have been keeping an eye on the water quality since 1976, and with no small success. One of the Board's officials, Joël Madec, observes: "In 1976 we analysed 330 samples. Last year between June and September alone we took 1200 such samples."

He explains that the water is judged from both bacteriological and chemical aspects. The surveillance points include the most popular beaches but also sites where there is a risk of pollution – the outlet of streams, storm-water drains and effluents from sewage treatment plants or sewage pumping stations.

The results of analysis, regularly up-dated, are sent to the appropriate public health authorities, and are permanently available to the general public. Bathing areas are classified as "good, average, temporarily poor, or poor". Any anomalies brought to light are dealt with promptly; in extreme cases beaches may be officially closed to swimmers. The Board puts pressure on public officials and private owners to correct whatever is wrong.

"Today 94% of the bathing beaches of Finistère have water that is rated either good or average", says Joël Madec. His boast is justified, especially since no beach is now declared "poor". Yet as recently as 1980, eight Finistère beaches were banned to swimmers; and at 20 others swimmers were warned that the water was of poor quality.

Despite the healthy state of the Finistère beaches, Maurice Saborin warned in his last annual report on the subject that "it is important to maintain our efforts to keep the seaside communities clean."

And in fact, although swimmers are not affected, there has been a proliferation of green algae and other marine vegetation. A consequence of farming practices as well as domestic and industrial pollution, these growths threaten the productivity of fish and shellfish cultivation. Natural imbalances of this kind call for strict action by specialist teams. Quite apart from caring for its bathing beaches, Brittany is taking very seriously the need to protect the environment in order to ensure the continued good health of its maritime economy. ■

Mr Louis Roger Dautriat is a journalist with the newspaper, Le Télégramme de Brest, Voie d'Accès au Port, BP 243, 2905 Morlaix, France.

Clean water at low cost

Prosper Mihindu-Ngoma

Rainwater from the roof may be the safest – provided it rains!

A variety of different factors, including limited financial resources, the low level of health education among the public, and the rapidly rising population combined to render the idealistic goals of the International Drinking Water Supply and Sanitation Decade (1981–1990) – universal access to adequate and safe water with appropriate sanitation – unattainable in almost all countries.

To meet this challenge, many African countries have launched experimental programmes of low-cost appropriate technology, which is easy to maintain and culturally acceptable by the communities concerned. These programmes have benefited from technical advice from WHO, UNICEF and UNDP and are supported by the Regional Centre for Drinking Water and Sanitation (CREPA) in Ougadougou, capital of Burkino Faso.

In the Congo, the most common techniques for supplying water are gravity feed pipes, rainwater collection, wells and manual pumps. Gravity feed supply is particularly suited to rural communities and costs least when there is community participation. If the source is sufficiently high above the village, the water is brought down through pipes made for the purpose in local materials. The system needs regular upkeep, particularly in cases where private taps are granted to individual families, while the quality of the water depends on safe collection from the source and proper upkeep of the installations.

Collection of rainwater in tanks as it flows off the house roof is economically and socially acceptable, but the initial high cost of the tank means that the materials used must be carefully chosen from what is locally available.

Where underground water sources are easily accessible and of good quality, hand pumps installed at each well can provide drinking-water simply and cheaply, and can be maintained by the users themselves.

If water is a mirror of health, as an old proverb says, it can also become a source of disease; more than one-third of deaths in developing countries are caused by drinking contaminated water. The UN Centre for Human Settlements estimates that a tenth of every individual's life is lost through water-related diseases. When sanitation breaks down, it nullifies all efforts to supply clean water. This is the case in Brazzaville where, among over 9000 dwellings officially inspected between April 1990 and March 1991, some 14% had unusable latrines and 19% had no sanitary installations at all. Such an environment does nothing for the quality of water in the neighbourhood!

If water is the mirror of health, as an old proverb says, it can also become a source of disease when sanitation breaks down.

The remedies suggested by CREPA put the emphasis on purification tanks to recycle waste water, and on ventilated latrines. These improved latrines, installed in a number of homes in Brazzaville, differ from traditional types by having a big ventilation pipe fixed on the outside which is fitted with an anti-fly grill. ■

Prosper Mihindu-Ngoma is a journalist with the Congolese Information News Agency. His address is B.P. 2144, Brazzaville, Congo.

WHO in action

New drug against schistosomiasis

United Republic of Tanzania: In Pemba, one of the islands of Zanzibar off the east coast of Africa, one out of every five schoolchildren used to have red urine from bleeding in the bladder. Tests with a chemical reagent, developed in collaboration with WHO and other scientific organizations, helped to detect blood in more than half of these cases. The bleeding was due to schistosomiasis, or bilharzia, a parasitic disease caused by a flatworm, which enters the body through skin contact with contaminated freshwater in rivers and ponds – for example, when bathing or fishing – and causes infection in the intestines and in the bladder.

Some 15 years ago, the treatment for schistosomiasis was considered worse than the disease. Now, thanks to collaboration between the pharmaceutical industry and WHO, an effective drug – praziquantel – is available. Used on a large scale by the schoolchildren in Pemba, it dramatically reduced the signs of the disease, without any serious side-effects.

Unfortunately, praziquantel is expensive: up to US$ 1.00 to treat one patient. For Kenya, Malawi, Nigeria and Zambia, which together have more than 30 million infected people, treatment on a large scale would not be possible. It would cost as much as their total health budgets for a year! They have therefore requested WHO to negotiate a reduction in the price of the drug with the manufacturers. UNICEF has joined WHO in these negotiations. Unless they succeed, the good results of the Pemba project cannot be repeated elsewhere.

Schistosomiasis in East Africa is called "kichocho" in Swahili. This is also the title of a videotape produced by WHO with the German Pharma Health Fund and the Italian government on the programme in Pemba.

A global information resource on drugs

Over 20 000 drug-related documents and publications (more than 80 a day) are sent each year by WHO's Action Programme on Essential Drugs to

Collection of urine samples will help to detect schistosomiasis.

people in countries all over the world. Because of limited funds among health professionals in developing countries, the Action Programme may be the only possible source of technical information for many of them. One young hospital pharmacist wrote recently from Ho Chi Minh City, Viet Nam, "I seriously lack new information on pharmaceuticals. I'm very poor ... so I can't afford the new books. I need your help ..."

The Action Programme's Documentation Centre, which contains a unique global collection of material related to essential drugs, also meets the needs of researchers, health professionals, educators and other development agencies. The centre contains, for example, essential drug lists and therapeutic guides from over 100 countries.

The *Essential Drugs Monitor* is the cornerstone of information activities. Through the *Monitor*, published in English, French and Spanish, and available free of charge, some 200 000 health professionals, educators, policy-makers, journalists and activists throughout the world regularly learn of new developments in drug policies, programmes, research and training.

All these information activities are part of the Action Programme's commitment to sharing ideas and knowledge, particularly in parts of the world with limited access to technical information.

Can we drink this water?

Undoubtedly, one of WHO's "best sellers" has been the *WHO Guidelines for Drinking-Water Quality*. The last revision was published in 1984, and was in three volumes: Volume One, *Recommendations*; Volume Two, *Health criteria and other supporting information*; and Volume Three, *Drinking-water quality control in small-community supplies*. Those of us who simply wish to know "can we drink this water?" can go straight to Volume One, whereas those who need to know (and are capable of understanding) "why" can refer to Volume Two. Volume Three is only applicable, as the title suggests, to rural areas.

The publication has been widely used by many countries to set their own national standards, confident that the guideline values set are based on sound toxicological evidence.

Now that new toxicological data, and even new "pollutants", are on the scene, the Guidelines are being revised. WHO will host a big meeting this September with participants from about 32 countries and some 40 experts to review the draft of the revision.

Will the new version also be a "best seller"? We think so! ■

Water flows: it is safe, it means health.

WHO on ...

Cholera and water

Where people live in poor conditions, and particularly when they do not have access to safe water and their sanitary facilities are inadequate, they are at risk from cholera and other diarrhoeal diseases.

Although cholera epidemics are frequently associated with contaminated food and may involve spread among close family contacts, it is safety of the available water that is most often the determining factor. Making sure that there is plenty of safe water not only denies cholera a common route of spread, but also means that food can be well washed, personal and domestic hygiene becomes easier, and the quality of life rises.

Where there is a threat of cholera, health authorities should concentrate on ensuring that people have access to safe water. If it is impossible to guarantee safe water at the point of delivery, then people must be advised and helped to purify their drinking-water by the use of chemicals or by boiling. Boiling is appropriate if chemicals are not available or practicable. However, it is very costly when compared with chlorination by hypochlorites.

Travellers to cholera-infected areas are advised to make sure that the food they eat is well cooked and hot, and that the water they drink is either boiled or sterilized with a suitable chlorine preparation.

The long-term prevention of cholera depends, more than anything else, on the provision of safe water. Only when this basic human need has been met will the threat of cholera be eliminated. ■

Monitoring chlorine levels in water.

Making water safe

Chlorination is the most effective and least costly method of making water safe for drinking. Particularly in country areas, if there is no source of treated water, people need to know that water can be made safe at home by adding a chlorine-releasing substance (usually sodium hypochlorite or calcium hypochlorite). If this is not available, everyone should know that boiling water for one minute will inactivate cholera microorganisms as well as most of the other pathogens associated with diarrhoeal diseases.

Household filtration of water can also help to inactivate *Vibrio cholerae*, but it is only partially effective and not entirely reliable. For safe water purification, porcelain filters should have a pore diameter of 1.5 micron; these will remove pathogenic organisms found in water with no need for further treatment.

Water can be kept safe in the home if the containers are regularly cleaned and rinsed with a bleach solution which is later removed by rinsing with safe water. The containers should have a close-fitting cover to keep out insects and dust. A tap at the bottom of the container, or a clean cup with a long handle, will enable people to draw water without dipping in their hands or dirty cups. ■

Microwave ovens

During the last two decades, microwave heating and cooking of food has become popular in many countries. Microwave ovens have found their way into restaurants and other catering establishments, and into private homes. In the USA 70% of all private homes possess microwave ovens, 50% in the United Kingdom, 20% in France and 15% in Germany. It follows that millions of people are daily eating or drinking food which has been either cooked or heated in such ovens. In spite of rumours and media reports to the contrary, there is no scientific evidence that foods prepared in microwave ovens present any health risks to consumers, provided that the instructions given by the manufacturers are followed.

Breast-feeding – the natural way

Breast milk is the perfect food for baby – nourishing and pure – and it protects the baby from disease.

Breast-feeding benefits both mother and baby. It creates a bond between them, at the same time giving the baby warmth, security and affection. Exclusive breast-feeding – that is, giving no other fluid or food than breast milk, *not even water* – in the first six months after birth helps to guard against another pregnancy.

The baby should be put to the breast as soon after birth as possible. The first milk, called colostrum, is of particular nutritional and health value because of its high protein content and the protection it offers against disease. It is the baby's first immunization.

Breast-feeding helps the mother's body return to normal after birth and protects her health: her uterus becomes smaller and she loses the weight she gained during pregnancy. When suckling starts within the first hour after birth, the risk of uterine bleeding is reduced. Breast-feeding also reduces the mother's risk of ovarian cancer and helps to protect her against breast cancer.

Virtually all mothers have enough milk for their babies. The flow of milk is stimulated by the baby's suckling at the breast. The more the baby suckles, the more milk will be produced.

Breast-feeding is simple and natural, but there are a number of practical notions a mother can learn that help ensure sucess. The mother should find a comfortable position, either sitting or lying, to breast-feed whenever her baby is hungry. She should make sure that her baby's mouth covers the entire nipple and surrounding breast tissue. Mothers can learn about breast-feeding from the women in their family, or from other mothers in the neighbourhood.

The mother should feed her baby with only breast milk for at least four to six months. Thereafter, she should begin giving her baby a variety of locally available nutritious foods, in addition to breast milk. Ideally breast-feeding should continue up to two years of age, or beyond if the mother so wishes.

Adapted from *Nutrition learning packages*, World Health Organization, Geneva, 1989. (Price Sw.fr.30. Price for developing countries Sw.fr.21.) ■

Smoking

Most people are now aware that tobacco smoking causes cancer and, among women, presents a risk of having smaller, premature babies with their own health problems. Contrary to the images promoted in cigarette advertising, smoking also causes premature wrinkles, bad breath, stained teeth and fingernails, gum disease, dental problems, a hoarse voice, and chronic cough ... indeed, a far from glamorous image!

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Good nursing care is essential for good health care. The next issue of *World Health* describes how nursing care and preventive health care are provided in different settings around the world. ■

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